The Effect of Bacterial Metabolism and Bacterial Interaction on the Electrical Output of Microbial Fuel Cells

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Microbial Fuel Cells (MFCs) are fuel cells that use the power of bacterial metabolic activity to convert chemical into electrical energy. In studies on MFCs, there remains speculation on whether the process is done by bacteria or ions and acidity in the soil. Much research on MFCs focuses on increasing the rate of electron flow and adding substrates to increase electrical output. However, this research project, determined whether bacteria in a MFC contributed to the electrical output; created low-cost, easy to build, sustainable, energy-efficient, mediator-less MFCs; and found possible ways of implementing MFCs to developing countries. The procedures are in order as followed: used the colonies of bacteria found in the soil and added substrates to see spikes in the electrical output in a MFC. Isolated the bacteria found on the electrodes of a MFC to reintroduce it into an pre-autoclaved MFC to see if isolated bacteria can generate a substantial charge. Identify the species of the isolated bacteria through 16S rRNA testing. The implications of the results are that it contributes to research on MFCs since it was found that bacteria are ultimately contributing to the electrical output of a MFC (shown significant through statistically tests at 98-99% confidence). It was shown that the MFC built generated a faster charge than other MFCs commercialized by 4 days, be used in developing countries by lighting an LED, and that bacteria other than the Shewanella and Geobacter species contributed to the electrical output of a MFC. Thus, in showing that metabolism affects the electrical output positively in a MFC there can be future direction in amplifying gene expression of certain metabolic processes in order to increase the electrical output of a MFC.

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